EZ LADDER Configurations for PLC on a Chip & PLC on a Chip Module

PLC ON A CHIP EZ LADDER CONFIGURATOON

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CHAPTER 1
GETTING STARTED

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Revision History

Revision	Release Date	Description of Changes
Rev. 0		Initial Release of Document.
Rev. 1	3/17/2005	Updates of Supported Functions & Scan Time
Rev. 2	8/5/2005	Added information for PWM functionality.
Rev. 3	3/21/2006	Updated functions list & added details for new features.

Definitions

HDIO	Divelbiss high density input output bus
Modbus	Communication Bus developed by Modicon

About this Document

The following information in this document is to aid in the implementation and development of products using Divelbiss EZ LADDER (based on PLC on a Chip). This document includes the information required to "configure targets" in EZ LADDER for the PLC on a Chip and PLC on a Chip Modules only. This document does not support configuring EZ LADDER with any other products. When configuring PLC on a Chip Modules, use the model number of the PLC on a Chip that is installed on the module.

In this document, the following conventions are used to distinguish elements of text:

BOLD	Denotes labeling, commands, and literal portions of syntax that must appear exactly as shown.
italic	Used for variables and placeholders that represent the type of text to be entered by the user.
SMALL CAPS	Used to show key sequences or actual buttons, such as OK, where the user clicks the OK button.

In addition, the following symbols appear periodically appear in the left margin to call the readers attention to specific details in the text:

Warns the reader of a potential danger or hazard that is associated with certain actions.

Appears when the text contains a tip that is especially helpful.

Indicates that the text contains information to which the reader should pay particularly close attention.

CHAPTER 2
SUPPORTED FUNCTIONS

Supported EZ LADDER Functions

PLC on a Chip is programmed using the Divelbiss EZ LADDER ladder diagram development platform. Below is the list of features provided in EZ LADDER that are available to use with any PLC on a Chip model. Refer to the EZ LADDER User's manual for detail on each function.

ABS
ADD
AND
AVG
BOOLEAN
CMP
CNTRTMR
DIRECT COIL
DIRECT CONTACT
DIV
DOWN COUNTER (CTD)
DRUM_SEQ
EEPROM_READ
EEPROM_WRITE
EQUAL TO (=)
FALLING EDGE DETECTOR (F_TRIG)
GC_SSI
GETDATE
GETTIME
GREATER THAN (>)
GREATER THAN OR EQUAL TO (>=)
HIGH_SPD_TMR
HYSTER
INTEGER
INVERTED COIL
INVERTED CONTACT
JUMP
KEYPAD
LABEL
LATCH
LCD_CLEAR
LCD_PRINT
LESS THAN (<)
LESS THAN OR EQUAL TO (<=)
LIMIT
MAVG
MAX
MIN
MOD
MULT
MUX
NOT
NOT EQUAL TO (<>)
OFF DELAY TIMER (TOF)
ON DELAY TIMER (TON)
OR
PID
PULSE TIMER (TP)
PWM
PWM_FREQ
REAL
RISING EDGE DETECTOR (R_TRIG)
ROL
ROR
RS
SEL
SERIAL_PRINT
SETDATE
SETTIME
SHL
SHR
SR
SUB
TIMER
UNLATCH
UP COUNTER (CTU)
UP / DOWN COUNTER (CTUD)
XOR

Modbus, PWM Outputs, LCD Display, Keypad and Serial Print is supported only on the 256K Memory PLC on a Chip Models.

CHAPTER 3
TARGET SETTINGS

Configuring PLC on a Chip Target Settings

Before EZ LADDER can function with a PLC on a Chip target, the target must be selected and options installed. Refer to the EZ LADDER Manual for details on EZ LADDER Menus and features.

In EZ LADDER, select **PROJECT....SETTINGS**. This will open the *Project Settings Window*. Select "PLC on a Chip" for the target. Figure 2.1 show the *Project Settings Window*.

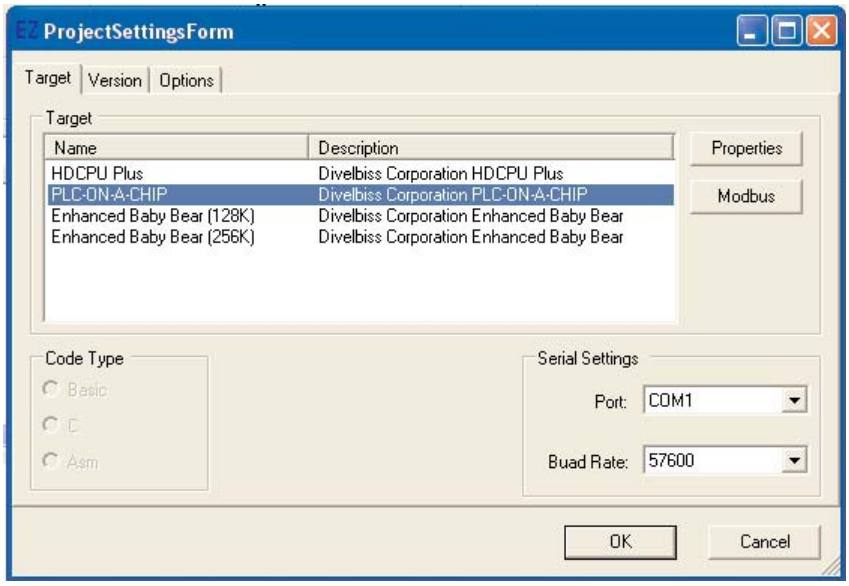

Figure 3.1

Once the "PLC on a Chip" target is selected, it must be configured with options that will be used in the ladder diagram program and hardware. Click the **PROPERTIES** button, which is only available when "PLC on a Chip" is selected as the target. A drop down dialog box will open with models of PLC on a Chip to select from. Select the model that will be used. For PLC on a Chip Modules, choose the model of the chip used on the module.

Devices may be added to the selected target by clicking the **ADD** button. This opens another dialog box with supported features such as on-board I/O, HDIO Bus, Real Time Clock and others. Select the option(s) that will be used and click **OK** until the project settings boxes are all closed. These options are now added to the project settings for use in the ladder diagram program. You must save the project to save these settings. Figure 2.2 shows the *Target Properties*.

Note: When most of these options are added, variable names are automatically assigned. They may be re-named if desired. Only options available for the selected target are listed.

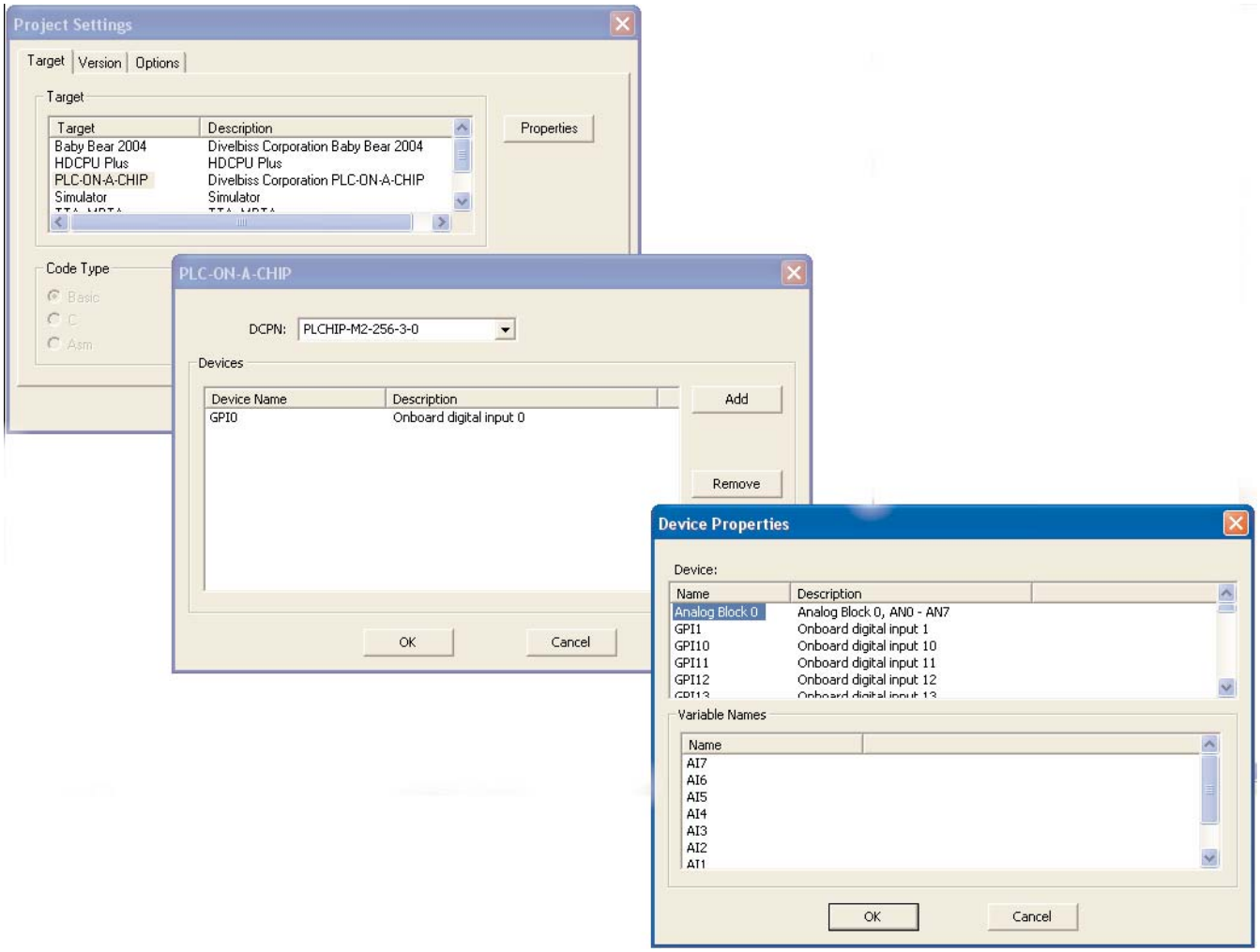
Project Settings
Target
Version
Options
Target
Target
Description
Baby Bear 2004
Divelbiss Corporation Baby Bear 2004
HDCPU Plus
HDCPU Plus
PLC-ON-A-CHIP
Divelbiss Corporation PLC-ON-A-CHIP
Simulator
Simulator
Properties
Code Type
Basic
C
Asm
PLC-ON-A-CHIP
DCPN:
PLCHIP-M2-256-3-0
Devices
Device Name
Description
GPI0
Onboard digital input 0
Add
Remove
OK
Cancel
Device Properties
Device:
Name
Description
Analog Block 0
Analog Block 0, AN0 - AN7
GPI1
Onboard digital input 1
GPI10
Onboard digital input 10
GPI11
Onboard digital input 11
GPI12
Onboard digital input 12
Variable Names
Name
AI7
AI6
AI5
AI4
AI3
AI2
AI1
OK
Cancel

Figure 3.2

Detailed Description of Target Settings

The following I/O and options are available for configuration on PLC on a Chip (model dependent).

On-Board Digital Inputs

GPI0-GPI33 GPI*x* is a digital input I/O address representing inputs shown in the PLC on a Chip pin-out. Each digital input that will be used in the ladder diagram programming must be added to the target configuration. To use in EZ LADDER, just insert contact and select the digital input point from the available list.

On-Board Digital Outputs

GPO0-GPO32 GPO*x* is a digital output I/O address representing outputs shown in the PLC on a Chip pin-out. Each digital output that will be used in the ladder diagram programming must be added to the target configuration. To use in EZ LADDER, just insert coil and select the digital output point from the available list.

HDIO Bus I/O

DI0.0-DI7.15 DI*x.y* is a digital input I/O address representing the inputs when using the HDIO Bus option

DO0.0-DO7.15 DO*x.y* is a digital output I/O address representing the output when using the HDIO Bus option

To use in EZ LADDER, just insert contact or coil. Name the contact or coil and click **OK** to create a new variable. Type in the address of the I/O point in the *Var I/O Number* field.

NOTE: When using the HDIO Bus, some on-board digital inputs and outputs are not available as they are used in the HDIO Bus option. Refer to the PLC on a Chip Pin assignments for details on which I/O points are used to control the HDIO Bus.

On-Board Analog Inputs

AN0-AN7 AN*x* is a analog input I/O address representing the analog inputs. Variables are automatically declared when this option is activated. To use in EZ LADDER, just insert the variable and select the analog input channel from the available list.

Real Time Clock

This option installs the EZ LADDER real time clock features for use with the real time clock hardware.

Scan Time

The Scan Time for the PLC on a Chip is based on 100 microsecond resolution. The HIGH_SPD_TMR function uses this time base.

PWM Outputs (Pulse Width Modulation)

PLC on a Chip 256K Models include 8 hardware pulse width modulation channels (PWM). These channels must be installed before they can controlled in the EZ LADDER diagram.

To install PWM Outputs in the target configuration:

1. Use the menu, select PROJECT....SETTINGS. The ProjectSettingsForm dialog will open. Select the target.
2. Click the PROPERTIES button.
3. Click the ADD button.
4. From the provided ADD dialog *Devices* list, select the PWM (Pulse Width Modulation). See Figure 3.3.

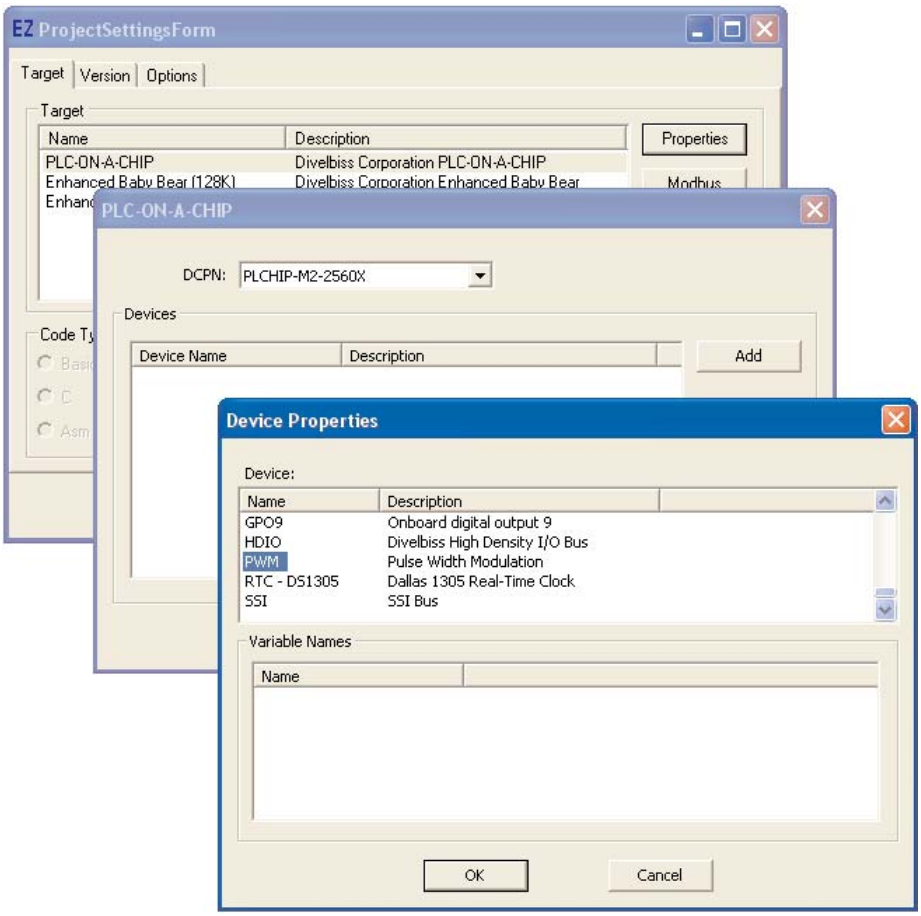

Figure 3.3

5. Click OK to install the PWM device and return to the target's properties dialog.
6. Click on PWM and a Properties button will appear on the right side of the target properties dialog.
7. Click the PROPERTIES button. The PWM Properties dialog will open. This dialog is used to add, remove and configure the PWM channels on the target. See Figure 3.4.

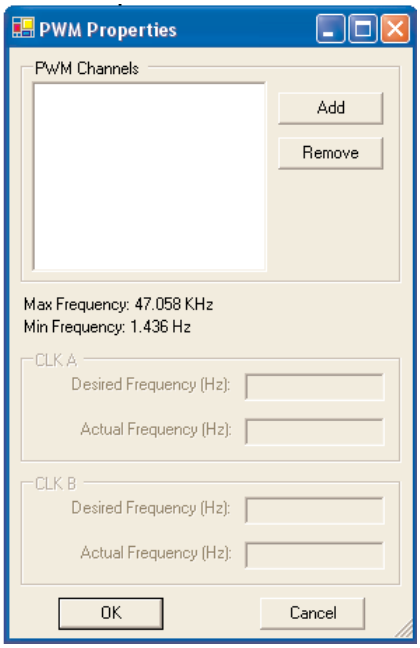

Figure 3.4

8. Click the ADD button. The ADD PWM dialog will open. Select the channels you wish to install (use).

9. Enter the desired frequency for Clock A and Clock B (if installed). The PLC on a Chip has 8 available PWM Channels. These 8 channels are either controlled with Clock A or Clock B. This allows two different PWM frequencies. The Minimum and Maximum frequencies are displayed in the PWM Properties dialog. The frequency for Clock A and Clock B must be in this range. The *ACTUAL FREQUENCY* is what will be seen on the actual PWM hardware output channels (as close as possible to the desired frequency; this is due to limitations of the hardware). See Figure 3.5.

10. Click OK to close the PWM Properties and save the changes.

11. Click OK to close the Target Properties and save the changes.

12. Click OK to close the ProjectSettingsForm dialog and save the changes.

The PWM channels are now ready for use using the PWM and PWM_FREQ functions. Refer to EZ LADDER Manual for details on using and configuring these functions.

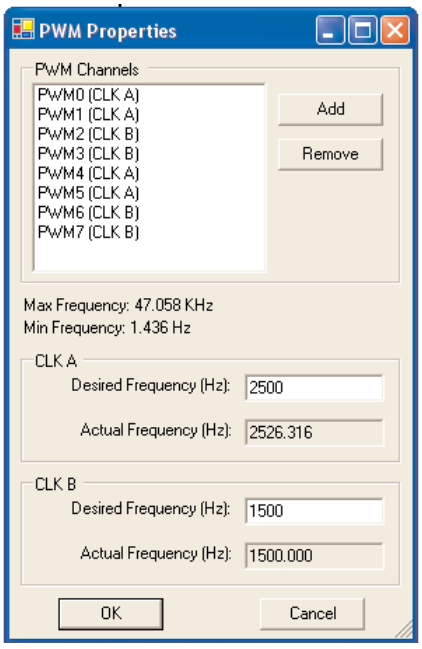

Figure 3.5

LCD Functionality

The LCD Display feature provides that ability to add an LCD display and print to it from the ladder diagram. The LCD Display functionality must be 'installed' on the target before it may be used. For information on connections and compatability of the display, please refer to the PLC on a Chip Circuit Design Guildelines document.

To install the LCD display in the target configuration:

1. Use the menu, select PROJECT....SETTINGS. The ProjectSettingsForm dialog will open. Select the target.
2. Click the PROPERTIES button.
3. Click the ADD button.
4. From the provided ADD dialog *Devices* list, select the LCD. See Figure 3.6.
5. Click OK to install the LCD Display and return to the target's properties dialog.
6. Click on LCD and a Properties button will appear on the right side of the target properties dialog.
7. Click the PROPERTIES button. The LCD Properties dialog will open. This dialog is used to configure the LCD display on the target. See Figure 3.7.

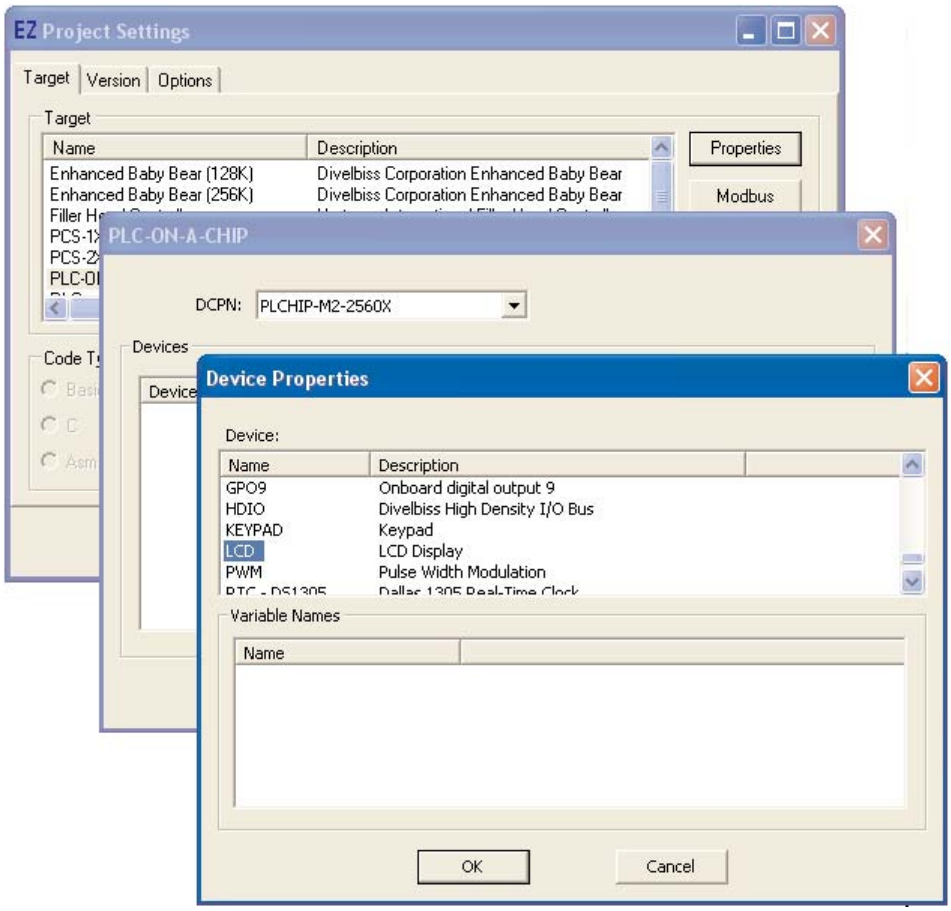

Figure 3.6

8. Select the **LCD PORT** to use from the available ports. You may use any of the listed ports provided it is not being used by another feature..
9. Select the **Controller**. Currently the HD44780 is the only supported controller.
10. Enter the number of **ROWS** on the display (1-4).
11. Enter the number of **COLUMNS** on the display (8-40).
12. Click OK to close the LCD Properties and save the changes.
13. Click OK to close the Target Settings Properties and save the changes.
14. Click OK to close the ProjectSettingsForm dialog and save the changes.

The LCD display is now ready for use once the display is physically connected. Refer to Section 10 - EZ LADDER Functions for using the LCD_PRINT & LCD_CLEAR functions.

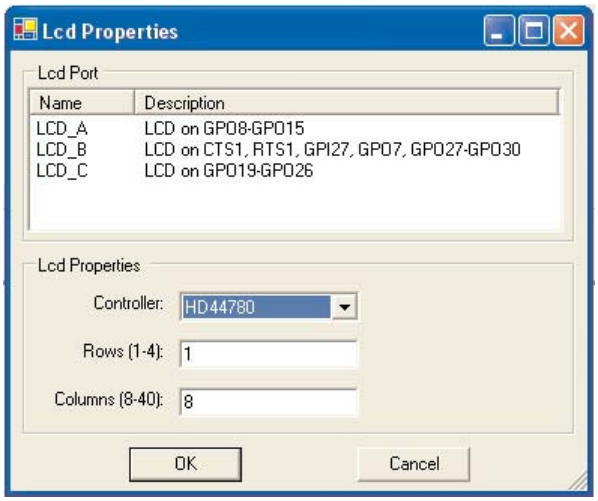

Figure 3.7

Keypad Functionality

The Keypad feature provides that ability to add a 4x5 keypad matrix and monitor it from the ladder diagram. The Keypad functionality must be 'installed' on the target before it may be used. For information on connections and compatability of the keypad, please refer to the PLC on a Chip Circuit Design Guildelines document.

To install the Keypad in the target configuration:

1. Use the menu, select PROJECT....SETTINGS. The ProjectSettingsForm dialog will open. Select the target.
2. Click the PROPERTIES button.
3. Click the ADD button.
4. From the provided ADD dialog *Devices* list, select the Keypad. See Figure 3.8.
5. Click OK to install the Keyapd and return to the target's properties dialog.
6. Click on Keypad and a Properties button will appear on the right side of the target properties dialog.
7. Click the PROPERTIES button. The Keypad Properties dialog will open. This dialog is used to configure the Keyapd on the target. See Figure 3.9.

8. Select the **KEYPAD PORT** to use from the available ports. You may use any of the listed ports provided it is not being used by another feature..

9. Click OK to close the Keypad Properties and save the changes.

10. Click OK to close the Target Settings Properties and save the changes.

11. Click OK to close the ProjectSettingsForm dialog and save the changes.

The Keypad is now ready for use once the keypad is physically connected. Refer to Section 10 - EZ LADDER Functions for using the KEYPAD function. The Keypad is read using the Keypad function but individual keys may be read as a discreet digital input.

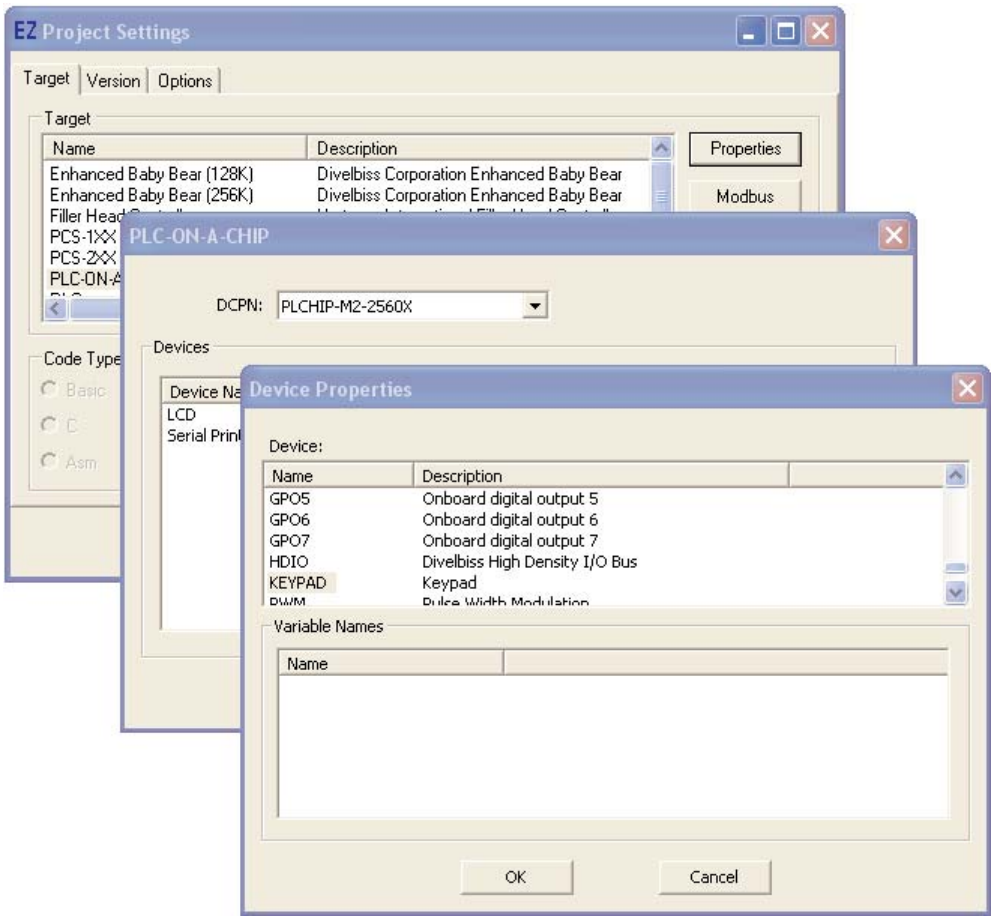

Figure 3.8

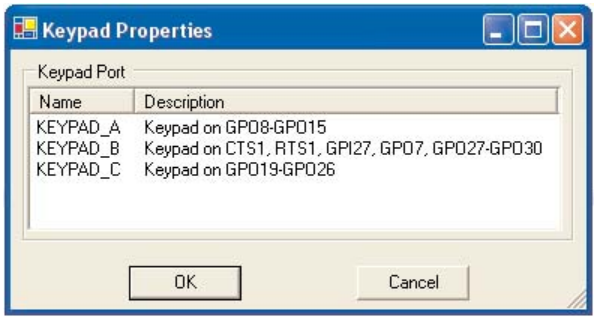

Figure 3.9

Serial Print Functionality

The Serial Print feature provides that ability to serially print using the multi-pupose port on the target. The Serial Print functionality must be 'installed' on the target before it may be used.

To install Serial Print in the target configuration for PLC on a Chip:

1. Use the menu, select PROJECT....SETTINGS. The ProjectSettingsForm dialog will open. Select the target.
2. Click the PROPERTIES button.
3. Click the ADD button.
4. From the provided ADD dialog *Devices* list, select the Serial Print. See Figure 3.10.

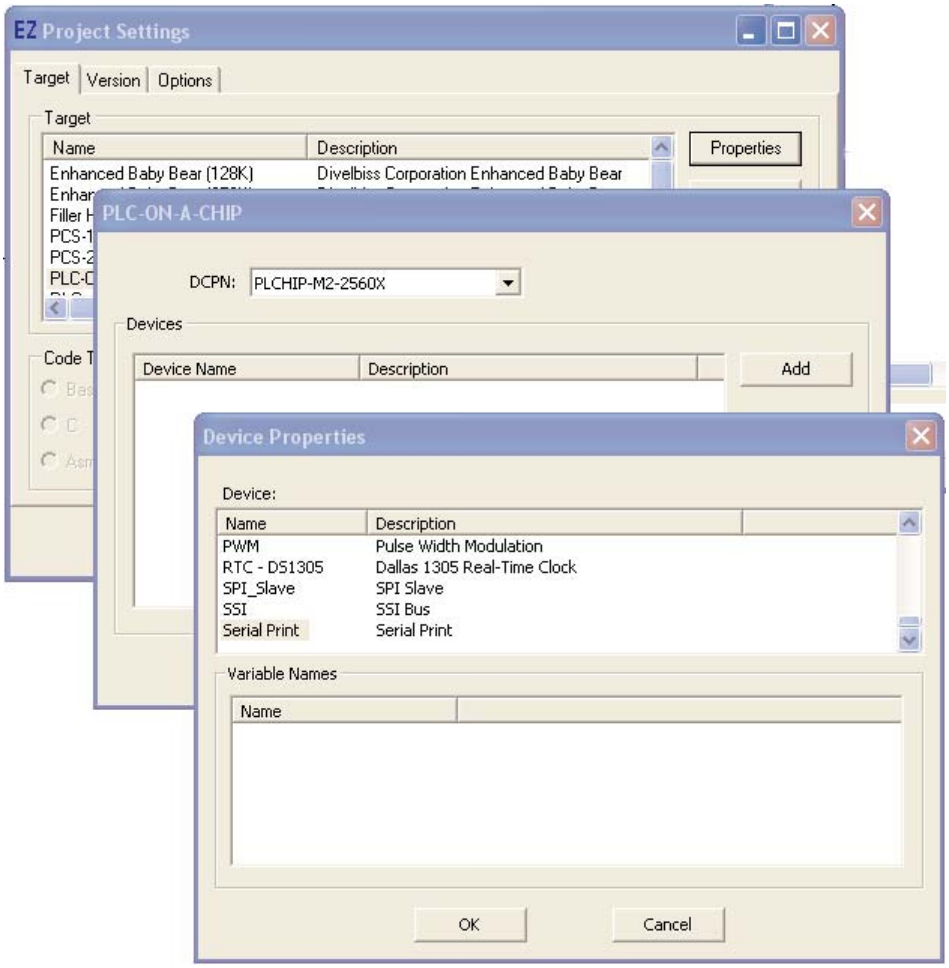

Figure 3.10

5. Click OK to install the Serial Print and return to the target's properties dialog.
6. Click on Serial Print and a Properties button will appear on the right side of the target properties dialog.
7. Click the PROPERTIES button. The Serial Properties dialog will open. This dialog is used to configure the Serial Port on the target. See Figure 3.11.

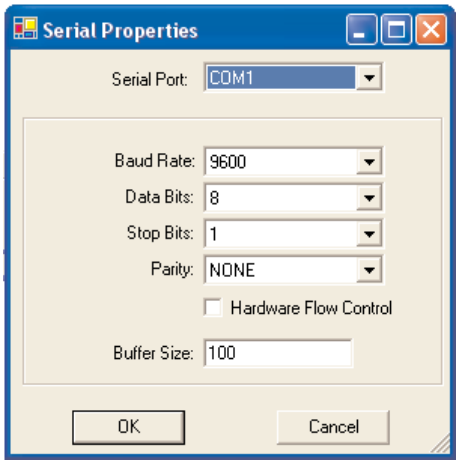

Figure 3.11

8. Select the **COM 1** to use from the available using the drop-down menu. Note COM 1 is the only port support for PLC on a Chip Targets at this time.
9. Select the **Baud Rate**. Supports 9600 to 115.2K baud.
10. Select **8 for Data Bits**. PLC on a Chip Targets currently only support 8 bit data.
11. Select **1 Stop Bit**. PLC on a Chip Targets currently only support 1 stop bit.
12. Select **None for Parity**. PLC on a Chip Targets currently only support None for parity.
13. Check the **Flow Control Box** if you require flow control.
14. Set the **Buffer Size**. It defaults to 100 bytes.
15. Click OK to close the Serial Properties and save the changes.
16. Click OK to close the Target Settings Properties and save the changes.
17. Click OK to close the ProjectSettingsForm dialog and save the changes.

The Serial Print is now ready for use. Refer to Section 10 - EZ LADDER Functions for printing serially using the SERIAL_PRINT Function.

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